

more, after which they took up courses to the northeast which they maintained till north of the line of lakes, thence they moved north of, and parallel to, the valley of the Saint Lawrence. Two of the storms disappeared to the north of the Lake region; three over the Saint Lawrence Valley; and one passed off the New Jersey coast and thence northeastward to Nova Scotia.

I.—On the morning of the 1st this area was central north of Minnesota, with high barometer immediately to the west, and a high area also to the eastward off the coast, which dominated the Atlantic states. This low area pursued a path somewhat to the south of east until the evening of the 2d, it then assumed a course to the northeastward over the Gulf of Saint Lawrence. Its progress was marked by no special features. The rain-area which attended extended southward to Missouri, the amount of precipitation increasing with the movement to the east, but at no time was it excessive until the conjunction of its rain-area with that prevailing in the Atlantic states. Prior to its disappearance to the northeast this low, which had produced but slight wind disturbance in its path, caused southeast velocities of short duration on the New England coast of from twenty to forty-four miles per hour.

II.—This area first appeared north of Montana on the evening of the 4th. It remained in this locality with but slight movement to the eastward until the evening of the 5th, the morning report of the 6th, however, shows the development of a trough extending from northern Dakota southwestward to Utah, with lowest pressure at Rapid City, Dak. Light local rains and high wind velocities over southern Dakota and Nebraska attended the formation of the trough of low pressure. The centre of low remained in practically the same locality until the night of the 7th, the disturbance meanwhile gathering intensity, the winds increasing, a velocity of sixty miles from the west being recorded at Valentine, Nebr., on the morning of the 7th. The rain-area, and amount of precipitation also, having increased. Morning reports of the 8th show the centre of low to have moved rapidly to the northeast over Lake Superior. In its passage north of the Lakes it was attended by occasional heavy rains in Iowa and Wisconsin, and at the time of its disappearance to the northeast the rain-area included New England and the Middle States, and the regions in the Ohio and lower Missouri valleys. This disturbance caused no storm velocities on the Atlantic coast, but high winds prevailed on Lake Ontario during the passage of the centre north of this lake, the winds having apparently increased in force after shifting to the west.

III.—This area appeared to the north of Montana on the evening of the 11th. The barometer throughout the country east of the Rocky Mountains was above the normal at this time, except in the extreme eastern portion of New England, the centre of high barometer being in Ohio. Unusually high wind velocities in the Rocky Mountain districts, with widespread but light rainfalls, marked the appearance of this low, which by the morning of the 13th had moved down over southern Minnesota as a well-defined storm. At this time the light rains had extended over the Lake region eastward to New England, while in the Mississippi Valley occasional heavy rainfalls were reported from Lake Superior to Missouri. The storm gradually gathered intensity in its path to the eastward, the rain-area by the next morning embraced the whole country east of the Mississippi, the storm was defined by the circumscribing isobar of 29.80 inches, the barometric gradient indi-

cated high winds, and it was evident that its progress to the Atlantic coast would be attended by considerable disturbance. The evening report of the 14th showed the storm-centre well defined over the eastern end of Lake Ontario, but the succeeding report revealed that the storm had resolved itself into two distinct disturbances, one of which, moving to the northeast, was central over Montreal, the other, to the southeast, off the New Jersey coast; thereafter these separate storms pursued distinct paths, the general course of both being to the northeast, the New Jersey storm skirting the coast.

IV.—This area was indicated by reports from the regions north of Montana on the evening of the 14th. By the evening of the 25th it had somewhat extended its influence southward, producing light rains and high winds in Colorado. Its general course was to the eastward, the centre of low at no time appearing within the limits of the United States, although its position could be located with much certainty from the character of the isobars. In addition to the precipitation in Colorado, light rains were also caused in northern Dakota and northern Minnesota. High winds were reported in eastern Dakota and western Minnesota on the 17th, but, during the passage of this low to the north of the Lakes, light winds as a rule prevailed. This area disappeared on the 18th to the north of the Lake region.

V.—This area appeared over Montana on the morning of the 18th. It rapidly moved down into northeastern Wyoming and southwestern Dakota, causing high westerly winds with light rain in Wyoming and Colorado, and high easterly winds with rain in Dakota. By the evening of the 19th the rain-area was widespread over the northern Rocky Mountains, the storm having recurved in northwestern Nebraska and slowly taken up a movement to the northeast. During its movement in this direction, high velocities were reported in Dakota, Minnesota, Kansas, Nebraska, and Iowa, and heavy rainfall at Duluth and Saint Paul, Minn., with a widespread area of precipitation attending. On the evening of the 20th the storm was central over Lake Superior, the barometer recording a pressure of 29.44 inches at Port Arthur, Ont., with a steep gradient to the west, producing high westerly winds. During the movement of the storm eastward from this locality storm velocities were generated at a number of the stations on the Lakes. The low area disappeared on the 22d over the Saint Lawrence Valley without having produced high wind on the north Atlantic.

VI.—This area appeared to the northwest of Montana on the evening of the 25th; at this time light rains prevailed in Wyoming and Colorado, which, however, soon gave place to fair weather. Occasional high winds occurred to the south of the low, which, although the centre remained practically stationary, was gradually extending southward, so that by the morning of the 27th the pressure in the upper Missouri valley and northern plateau regions was considerably below the normal. The course of the low was but slightly to the south of east, the centre remaining at all times without the United States. It disappeared when north of Lake Superior. In its advance eastward there was considerable crowding of isobars, and high winds prevailed in the southern quadrants. This low was remarkable for the general absence of precipitation within the region of its influence, notwithstanding its decided character, the barometer reading 29.20 inches on the evening of the 27th when central north of eastern Montana, and the temperature standing very considerably above the normal.

NORTH ATLANTIC STORMS FOR AUGUST, 1889 (pressure in inches and millimetres; wind-force by Beaufort scale).

The paths of the depressions that appeared over the north Atlantic Ocean during August, 1889, are shown on chart i. These paths have been determined from international simultaneous observations by captains of ocean steamships and sailing vessels received through the co-operation of the Hydro-

graphic Office, Navy Department, and the "New York Herald Weather Service."

Eight depressions have been traced for August, 1889; the average number traced for the corresponding month of the last six years being nine. Of the depressions traced for the

current month but one advanced eastward over the ocean south of the fiftieth parallel; two first appeared east of the twenty-fifth meridian; four are first charted in high latitudes west of the thirty-fifth meridian, to which region they had apparently advanced from or near the coast north of Newfoundland, and one is located off the coast of the United States from the 25th to 27th, inclusive. The movement of the depressions along and north of the trans-Atlantic steamship routes was uniformly eastward, inclining to northeast in the vicinity of the British Isles. The storm of the 25th to 27th off the coast of the United States apparently originated over or north of the Bahamas, and thence moved north of the thirty-fifth parallel where it dissipated. Reports at hand will not admit of accurately defining the paths of the storms that appeared over the Gulf of Mexico and the Caribbean Sea during the latter part of the month, nor of the storm in the west Gulf on the 8th and 9th. On the 19th a depression was indicated south of San Domingo, in which region it apparently remained until the 23d. On the latter date a cyclonic disturbance was apparently central south of Cuba and to the west of Jamaica. On the 24th a disturbance of considerable strength was central off or north of the western extremity of Cuba, after which it apparently moved westward over the Gulf, over the west-central portion of which severe storms were reported until the 27th.

Compared with the corresponding month of previous years the storms that appeared over the north Atlantic Ocean during August, 1889, corresponded closely with the average in number and intensity, although extremely low barometric readings noted for preceding years were not reported. The storms of tropical or sub-tropical origin which appeared over the Caribbean Sea and the Gulf of Mexico, while apparently possessing considerable strength, were not well defined, and reports do not indicate that the depressions reported by West Indian stations moved north of the twenty-fifth parallel. In August of preceding years well-defined storms of destructive violence, averaging about two per month, have moved westward over or near the West Indies, and thence recurved over the Gulf of Mexico or over or off the Atlantic coast states. Storms of great strength have also appeared over the west Gulf. Among notable West Indian and Gulf storms charted and described in the REVIEW for August in preceding years are: 1879, 17th to 19th, storm moved from the Bahamas along the Atlantic coast, attended by gales of hurricane force and unusually high tides. 1880, 12-13th, storm in west Gulf devastated the Texas coast at the mouth of the Rio Grande; 18th, storm at the Island of Jamaica caused loss of life and immense damage to shipping and property; 26th to 31st, storm moved north of the Bahamas, crossed northern Florida 29-30th, strewing the Florida coast with wrecks and doing great damage to property and crops. 1881, 27th, storm moved north of west to the coast, near Savannah, Ga., causing extensive destruction of property and lamentable loss of life. 1885, 23d to 25th, storm moved along east Florida and south Atlantic coasts, causing great destruction on the south Atlantic coast, where the damage was estimated at \$1,500,000. 1886, two severe storms moved north of west over the Caribbean Sea, one recurring north over Cuba and the Bahamas, and the other passing into the Gulf; 19-20th, a terribly destructive storm in the west Gulf; at Indianola, Tex., not a building was left standing, and the barometer fell to about 28.00 (711). 1887, two energetic and destructive storms moved from the vicinity of the Windward Islands, north of the West Indies, to the Bahamas, where they recurved north and northeast. 1888, 16th to 19th, storm moved from the Bahamas to the west Gulf coast, attended by violent squalls and incessant rain.

The following are brief descriptions of the depressions traced over the north Atlantic Ocean for August, 1889:

1.—This depression was central on the 1st in about N. 57°, W. 21°, with central pressure below 29.40 (747). On this date the pressure was low over the entire ocean north of the fiftieth parallel, the presence of a second depression being indicated northeast of Newfoundland in about latitude N. 55°. By the

2d the depression traced had moved northeast to about the fifteenth meridian, after which it disappeared north of the region of observation.

2.—This depression appeared northwest of Ireland on the 4th, and thence moved eastward and disappeared over the British Isles, attended by moderate to fresh gales.

3.—This depression apparently moved eastward from the Labrador coast, and at noon, Greenwich time, of the 6th was central in about N. 57°, W. 39°, whence it passed eastward to the British Isles by the 10th without evidence of marked energy.

4.—This depression advanced eastward from the North American continent north of the region of observation, and on the 13th was apparently central off the southern extremity of Greenland, from which position it passed eastward and disappeared north of the British Isles after the 16th, attended by a gradual decrease in pressure and fresh to strong gales.

5.—This depression was a continuation of low area iii, and on the 16th was central over Newfoundland, with moderate to fresh gales over and west of the Grand Banks. By the 17th the centre of depression had moved eastward to the fortieth meridian, after which it apparently moved rapidly northeastward and united with a depression which occupied the ocean between the British Isles and Iceland.

6.—This depression moved eastward from or north of Newfoundland, and on the 19th was central in about N. 54°, W. 39°, whence it advanced eastward and disappeared over the British Isles after the 21st, attended by moderate to fresh gales.

7.—This depression is first located in N. 57°, W. 40°, under date of the 27th, from which position it moved north of east to the twenty-fourth meridian by the 28th, and thence passed beyond the region of observation, attended throughout by moderate to fresh gales.

8.—This depression apparently originated off the Florida or south Atlantic coasts, and reports admit of locating its centre in about N. 33°, W. 74° on the 25th. By the 26th the storm-centre had moved northeast to the thirty-fifth parallel, and by the 27th had advanced to about the thirty-seventh parallel; after which its location cannot be determined, and it is thought that the depression dissipated on the west edge of an area of high pressure which occupied the ocean to the eastward. A noteworthy feature of this storm was the unusual strength of the gales attending a relatively slight barometric depression. The barometer readings reported near the storm-centre did not fall below 29.90 (759) from the 25th to 28th, inclusive, while after the 25th strong to whole gales, attaining hurricane force on the 27th and 28th, were reported west of the seventieth meridian and between the thirty-fifth and fortieth parallels.

The following telegraphic reports from the Rev. Father Benito Vines, S. J., Director of the Meteorological Observatory of the Royal College of Belen, Havana, Cuba, indicate the meteorological conditions which prevailed at stations in San Domingo, Cuba, and over the east Gulf for several days preceding the appearance of this depression north of the Bahamas. From the 19th to the 22d, inclusive, the barometer at San Domingo was low and falling, a reading of 29.41 (747) being reported on the 22d, after which there was a slight increase in pressure until the 23d, the date of the last report. During this period the wind apparently continued between south and southeast. The reports of the 23d from Santa Clara and Santiago de Cuba indicated the presence of a cyclonic depression south of Cuba, and the observations at Havana of the 23d and 24th showed the presence of a disturbance over the Gulf:

Santiago de Cuba, August 19th, 5.30 p. m.: observations from San Domingo, 5 p. m., barometer 29.57 (751), wind se., strong, cloudy, calm sea. At present, in Havana, there are only observed indications of an anti-cyclone in the first quadrant. Santiago de Cuba, August 20th: observations from San Domingo, 4 p. m. to-day, barometer 29.53 (750), wind s., storm. Santiago de Cuba, August 21, 4 p. m.: observations from San Domingo, 3 p. m., barometer 29.45 (748), wind s., storm. Puerto Plata the same. Havana, August 22d: the latest telegrams received from San Domingo and Puerto Plata apparently indicate that the storm has crossed over the central portion of the island of San Domingo in a northwest direction. In Havana, at present, the lower currents have continued to be apparently anti-cyclonic, moderating in intensity and causing a fall of the barometer, whilst the upper currents indicate a

cyclonic disturbance from the direction of the Gulf. From the east there is nothing upon which to found a probability, and this apparently indicates that the storm referred to by the telegrams is of moderate dimensions, and is still at a great distance. San Domingo, 22d, 5 p. m.: barometer 29.41 (747), wind se., severe storm, sea agitated. San Domingo, 23d, 5 p. m.: barometer 29.45 (748), wind se., light storm, sea calm. Santa Clara, 23d, 6 p. m.: barometer 29.49 (749); during the day cloudy sky, rain at times from ese., and wind very light, variable in the second quadrant, shifting now to ene., complete calm, and plumiform cirrus in small numbers. Havana, 23d, noon: the barometer has continued to fall and the wind has shifted to s. The cyclonic disturbance from the Gulf, which until the present time appeared to be of moderate intensity, has increased somewhat in strength, controlling the lower currents. No indications of a cyclone are observed from the east. Santiago de Cuba, 23d, 3 p. m.: barometer 29.88 (759), barometer this morning 29.98 (762), cloudy, thunder-claps, cloudy to the south. Depression appears to continue sw. or w. $\frac{1}{4}$ nw. Santiago de Cuba, 24th, 7 a. m.: barometer 29.98 (762), cumulo-stratus from se., cirro-cumulus from s., calm, misty; 3 p. m., barometer 29.98 (760), cumulo-stratus from the s., cirrus from the west, wind s., good weather. Havana, 24th, noon: the barometer has commenced to rise slowly with gusts of wind from the s., sky cloudy, rain and squalls. The greater force of the gusts of wind have been from twenty-seven to thirty-two miles per hour; in the force of the squalls the gusts of wind inclined to sw. The cyclonic disturbance in the Gulf, more intensified and organized, has been slowly receding to the nw. Of the storm in San Domingo up to the present time there have been no indications whatever at Havana.

The following storm warnings were telegraphed from this office preceding and attending the advance of this depression off the Atlantic coast:

WASHINGTON, D. C., August 23, 1889—10.55 P. M.
Observers, Norfolk, Wilmington, Charleston, Savannah, Jacksonville, Cedar Keys, Jupiter, Mobile, New Orleans, Galveston, Key West:

Reports indicate that a severe storm is approaching Florida from the southeast, although dangerous winds have not occurred at any of the coast stations and conditions of storm are not sufficiently defined to justify the ordering of signals. Further notice will be given should the danger increase.

DUNWOODY.

WASHINGTON, D. C., August 25, 1889—10.55 P. M.
Observers, New York, Boston, Philadelphia:

Cyclone apparently following course of the Gulf Stream. It will doubtless pass well to the eastward. It is apparently central east of North Carolina.

DUNWOODY.

WASHINGTON, D. C., August 25, 1889.
Secretary Maritime Exchange, New York; Observer, Boston:

Cyclone apparently central southeast of Hatteras, moving northward. Centre not as yet clearly defined, but warnings stating that it is not safe to sail have been issued to Norfolk. Will communicate further information as received.

DUNWOODY.

WASHINGTON, D. C., August 25, 1889.
Observers, Norfolk, Norfolk section, Fort Monroe:

Hoist cautionary northeast signals at 11.10 a. m. Storm apparently central southeast of Hatteras, moving northward. Considered dangerous to leave port until further information is received showing more definitely the location of storm. Notice will be telegraphed.

DUNWOODY.

WASHINGTON, D. C., August 25, 1889.
Observers, Breakwater, Atlantic City, Sandy Hook, Narragansett section, Wood's Holl, Wood's Holl section:

Hoist cautionary northeast 12.40 p. m. Storm central off Hatteras, moving north. Brisk to high northeast winds indicated for middle Atlantic and south New England coasts.

DUNWOODY.

WASHINGTON, D. C., August 26, 1889—9.40 A. M.
Observers, Narragansett section, Wood's Holl, Wood's Holl section:

9.50 a. m. Change cautionary to storm northeast signals. Cyclone apparently moving northeastward following general course of Gulf Stream; apparently central to the southeast and distant from the coast. Dangerous gales will continue on the southeast New England coast.

DUNWOODY.

WASHINGTON, D. C., August 26, 1889—10 A. M.
Observers and displaymen, New Haven, New London, Newport section; Boston, Boston section:

Hoist cautionary northeast signals at 10.30 a. m. Storm apparently central to the southeast of New England and distant from the coast, moving northeast. Dangerous gales are indicated for the southeast New England coast to-day.

DUNWOODY.

WASHINGTON, D. C., August 26, 1889—12.10 P. M.
Observer, New York:

Hoist cautionary northeast signals at 12.30 p. m. Brisk to high northeast winds indicated for the middle Atlantic coast. Cyclone apparently central distant from the coast, moving northeast along the Gulf Stream.

DUNWOODY.

WASHINGTON, D. C., August 26, 1889—12.10 P. M.
Secretary Maritime Exchange, New York City:

Brisk to high northeast winds indicated for the middle Atlantic coast. Cyclone apparently central distant from the coast, moving northeast along the Gulf Stream.

DUNWOODY.

WASHINGTON, D. C., August 26, 1889—12.10 P. M.
Observers, Norfolk, Norfolk section, Fort Monroe, Breakwater, Atlantic City, Sandy Hook:

12.15 p. m. Continue signals. Brisk to high northeast winds indicated for the middle Atlantic and southern New England coasts. Cyclone apparently central distant from the coast, moving northeast along the Gulf Stream.

DUNWOODY.

WASHINGTON, D. C., August 27, 1889—12.20 P. M.
Observers, Norfolk, Norfolk section, Fort Monroe, Breakwater, Atlantic City, Sandy Hook, New York:

12.25 p. m. Continue signals. Storm apparently central off the North Carolina coast. Dangerous northeast winds will continue on the middle Atlantic and New England coasts.

DUNWOODY.

WASHINGTON, D. C., August 27, 1889—12.20 P. M.
Observers, Narragansett section, Wood's Holl, Wood's Holl section:

12.25 p. m. Change storm to cautionary. Storm apparently central off the North Carolina coast. Dangerous northeast winds will continue on the middle Atlantic and south New England coasts.

DUNWOODY.

WASHINGTON, D. C., August 28, 1889—12.35 P. M.
Observers, Norfolk section, Norfolk, Fort Monroe, Breakwater, Atlantic City:

12.45 p. m. Continue signals.

DUNWOODY.

WASHINGTON, D. C., August 29, 1889—9.45 A. M.
Observers, Norfolk section, Norfolk, Fort Monroe, Breakwater, Atlantic City:

9.45 a. m. Signals down.

DUNWOODY.

The following correspondence, by telegraph, was had with Commander G. W. Sumner, commanding the U. S. S. "Galena," relative to the movement of this depression and the storms attending it:

NAVY YARD, BROOKLYN, N. Y., August 24, 1889.

CHIEF SIGNAL OFFICER, Washington, D. C.:

Are the weather conditions along the coast favorable for starting for Hayti?

G. W. SUMNER,

Commander, U. S. N., U. S. S. "Galena."

WASHINGTON, D. C., August 24, 1889.

Commander G. W. SUMNER,

U. S. S. "Galena," U. S. Navy Yard, Brooklyn, N. Y.:

Weather conditions are not favorable; looks like a cyclone off Florida coast. Would advise delay in sailing until further notice.

DUNWOODY,

Acting Chief Signal Officer.

WASHINGTON, D. C., August 24, 1889—10.50 P. M.

Commander G. W. SUMNER,

U. S. S. "Galena," Brooklyn Navy Yard:

From the 8 p. m. reports to-night the conditions are less threatening than they have been during the past two days. The winds are all light on the coast, and the barometer about 30.00 inches at all southern stations. If the West India cyclone continues it is too far distant from the coast to affect land stations. It may, however, be moving northward east of the Gulf Stream.

DUNWOODY,

Acting Chief Signal Officer.

BROOKLYN, N. Y., August 25, 1889.

CHIEF SIGNAL OFFICER, Washington, D. C.:

Your last telegram received. If you have any later information in reference to the cyclone or coast weather please telegraph me at Sandy Hook.

G. W. SUMNER,

Commander U. S. N., U. S. S. "Galena."

WASHINGTON, D. C., August 25, 1889—3 P. M.

Commander G. W. SUMNER, U. S. N.,

U. S. S. "Galena," Sandy Hook, N. J.:

Have ordered warning signals at stations from Hatteras to Boston. Storm is probably dangerous off the middle Atlantic coast; wind at Henry thirty miles; Atlantic City twenty-four miles northeast, increasing.

DUNWOODY.

NOTE.—The "Galena" was signaled off Sandy Hook and this message delivered to her.

WASHINGTON, D. C., August 25, 1889—10.15 A. M.

Commander G. W. SUMNER, U. S. N.,

U. S. S. "Galena," Sandy Hook, N. J.:

The morning report indicates cyclone to the east of Hatteras although winds on coast do not exceed twenty miles at present. I have called for special reports during the day and will be able to telegraph you further information at 3 p. m.

DUNWOODY.

NOTE.—The "Galena" was signaled off Sandy Hook and this message delivered to her.

SANDY HOOK, N. J., August 25, 1889.

CHIEF SIGNAL OFFICER, Washington, D. C.:

All despatches received, many thanks for your kind attention and valuable information.

G. W. SUMNER, Commander, U. S. N.

SANDY HOOK, N. J., August 26, 1889.

CHIEF SIGNAL OFFICER, Washington, D. C.:

U. S. S. "Galena" signals: "Can we sail south?" Answer yes or no.

DELAMOTTE, Manager.

WASHINGTON, D. C., August 26, 1889—9.40 P. M.

To Commander G. W. SUMNER, U. S. N.,
U. S. S. "Galena," Sandy Hook, N. J.

I do not consider it safe to sail from Sandy Hook to-night. Northeast gales continue off the coast from Hatteras to Nantucket. The force of wind will probably decrease, rendering it safe to sail to-morrow; but would not advise leaving until after Tuesday morning reports. Will telegraph you at 9 a. m., Tuesday.

DUNWOODY,
Acting Chief Signal Officer.

WASHINGTON, D. C., August 27, 1889—9.35 A. M.

To Commander G. W. SUMNER, U. S. N.,
U. S. S. "Galena," Sandy Hook, N. J.

It is not considered safe to sail south; the morning conditions are more threatening off the middle Atlantic and North Carolina coasts; probably blowing strong northeast gales within one hundred miles of Sandy Hook. Will send special report at 12 m.

DUNWOODY,
Acting Chief Signal Officer.

WASHINGTON, D. C., August 27, 1889—12.30 P. M.

Commander G. W. SUMNER,
U. S. S. "Galena," Sandy Hook, N. J.:

Not safe to sail from Sandy Hook south to-day. It is blowing a gale off the Virginia coast. Wind thirty-six miles northeast at Henry at 11 a. m.; thirty-two east at Block Island, and twenty-eight northeast at Atlantic City.

DUNWOODY,
Acting Chief Signal Officer.

SANDY HOOK, N. J., August 28, 1889.

CHIEF SIGNAL OFFICER, Washington, D. C.:

"Galena" signals: "Can we sail south; answer yes or no."

Replied: "Do not sail until after next report." Advise.

WM. DELAMOTTE, Manager.

WASHINGTON, D. C., August 28, 1889—9.45 A. M.

Commander G. W. SUMNER,
U. S. S. "Galena," Sandy Hook, N. J.:

No. Still blowing northeast gale off the Virginia and North Carolina coasts. Wind now thirty-six miles northeast at Cape Henry.

DUNWOODY,
Acting Chief Signal Officer.

WASHINGTON, D. C., August 28, 1889—12.41 P. M.

Observer, Sandy Hook, N. J.:

11 a. m. reports show wind decreasing in force; have called for 2 p. m. reports, and will telegraph the conditions at 3 p. m. It appears now as if it would be safe to sail this evening. Repeat to commander of "Galena."

DUNWOODY,
Acting Chief Signal Officer.

WASHINGTON, D. C., August 28, 1889—3 P. M.

Commander G. W. SUMNER,
U. S. S. "Galena," Sandy Hook, N. J.:

2 p. m. reports show wind decreasing in force. Safe to sail south to-night.

DUNWOODY,
Acting Chief Signal Officer.

FOG IN AUGUST.

The following are limits of fog-areas on the north Atlantic Ocean during August, 1889, as reported by shipmasters:

Date.	Entered.			Cleared.			Date.	Entered.			Cleared.		
	Lat. N.	Lon. W.		Lat. N.	Lon. W.			Lat. N.	Lon. W.		Lat. N.	Lon. W.	
1	56 05	39 58		55 56	41 08		16	44 40	52 04		44 30	52 39	
1-2	43 42	48 40		42 47	54 39		16	45 58	51 00		46 30	49 02	
2				46 53	51 57		16-17	52 45	51 30		52 15	54 00	
3	53 06	49 12		51 40	56 14		16-17	43 20	52 53		43 14	54 23	
3-4	52 35	52 25		53 35	49 00		16-17	46 55	52 08		43 24	50 20	
3-4	48 53	46 37		43 44	57 38		16-17	43 58	57 31		43 00	60 48	
4	50 50	58 00		49 30	60 30		17	43 07	56 38		43 20	56 10	
4-5	42 13	58 01		42 15	59 50		17-18	46 37	52 12		45 10	54 40	
4-5	44 56	46 05		43 56	49 58		18	52 10	54 30		53 10	50 20	
6	50 15	45 36		49 15	47 15		18-19	45 24	45 28		44 58	47 18	
6-7	48 12	42 51		45 23	52 19		20	43 30	50 30		43 50	48 00	
7	46 24	45 05		47 00	42 21		20-21	40 53	68 00		40 47	69 40	
8	52 00	53 40					22	47 52	48 40		49 32	43 58	
8	42 50	64 45		42 40	65 45		22	41 41	69 41		40 43	69 45	
8	48 19	48 21		47 20	50 43		22-23	53 53	47 53		52 35	52 22	
8-9	46 52	51 33		45 45	54 02		24-25	49 06	43 03		46 21	53 42	
11	42 41	64 06		42 34	66 30		24	46 25	52 16		46 05	52 57	
11-12	45 07	49 00		44 28	51 45		24	250 miles from		180 miles from			
12-13	45 00	52 10		47 45	43 19			Boston Light.		Boston Light.			
12-13	48 51	45 11		45 59	53 03		25	52 00	45 00		52 00	48 00	
13	46 06	48 08		48 06	43 19		30	43 47	68 30		43 22	68 40	
15-16	45 45	55 30		Off Cape Pine.			30-31	41 07	66 44		40 47	68 45	
15-61	40 45	68 31		40 40	68 59		31	45 55	49 16		45 48	49 38	

The limits of fog-belts west of the fortieth meridian are shown on chart i by dotted shading. In the vicinity of Newfoundland and the Grand Banks fog was reported on twenty-two dates, as compared with eighteen dates for July, 1889, and

twenty-two dates for August, 1888. Between the fifty-fifth and sixty-fifth meridians fog was reported on six dates, as compared with ten dates for July, 1889, and thirteen dates for August, 1888. West of the sixty-fifth meridian fog was reported on nine dates, as compared with eleven dates for July, 1889, and nine dates for August, 1888. Compared with the preceding month there has been a decrease in fog-frequency, the decrease being most marked east of the fifty-fifth meridian. Over and near the Grand Banks fog was reported with southerly winds, and low barometric pressure to the northward, except on the 7th, 8th, and 25th, when unsettled weather and high barometer prevailed. On twelve dates fog was reported off the northern coast of Newfoundland, in the region in which ice was most frequently reported during the month. Between the fifty-fifth and sixty-fifth meridians fog was reported with the approach or passage to the northward of areas of low pressure, except on the 8th, when variable winds, high barometer, and unsettled weather prevailed. West of the sixty-fifth meridian fog was reported with southerly to easterly winds and unsettled weather.

OCEAN ICE IN AUGUST.

The following table shows the southern and eastern limits of the region within which icebergs or field ice were reported for August during the last eight years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
August, 1882	46 50	46 00	August, 1882	46 50	46 00
August, 1883	43 26	51 41	August, 1883	48 00	44 00
August, 1884	43 24	48 44	August, 1884	47 50	43 50
August, 1885	43 48	52 04	August, 1885	48 03	42 45
August, 1886	48 35	48 46	August, 1886	50 00	48 00
August, 1887	42 21	49 51	August, 1887	48 06	40 00
August, 1888			August, 1888	51 53	55 00
August, 1889	43 34	48 38	August, 1889	53 00	45 00

* Straits of Belle Isle. † Isolated field ice in N. 58°, W. 40°.

In August, 1889, the southernmost ice reported, which consisted of a few small pieces of ice, was about two and one-half degrees south of the average southern limit, and the easternmost ice noted, an iceberg, was about one degree east of the average eastern limit of ice for the month. Ice was most frequently reported from Belle Isle eastward to the fiftieth meridian; it was reported south of the fiftieth parallel on four dates only, and no icebergs or field ice were reported off the coast of Newfoundland south of the forty-ninth parallel, save along the extreme eastern edge of the Grand Banks. Compared with ice reported for July, 1889, a marked deficiency is shown, except in and east of the Straits of Belle Isle; the extreme southern limit has contracted about one degree, while the eastern limit, north of the fiftieth parallel, has extended about two degrees. Compared with the corresponding month of preceding years no unusual features are presented in connection with the quantity or distribution of Arctic ice for the current month.

The following positions of icebergs and field ice reported are shown on chart i by ruled shading:

1st.—N. 52° 00', W. 54° 47' to Belle Isle, fifty large bergs; from Belle Isle to Point Amour, over two hundred large bergs; N. 48° 54', W. 48° 56', a large berg.

2d.—N. 51° 07', W. 57° 40', small bergs, increasing in size in the Straits of Belle Isle; off Point Piche, off Belle Isle, and in the Straits, numerous large bergs; N. 46° 47', W. 48° 00', one large and two small bergs.

3d.—N. 52° 59', W. 50° 58' to N. 51° 34', W. 56° 27', on the 5th, numerous large bergs, and numerous large bergs in the Straits of Belle Isle; N. 52° 53', W. 52° 02' to 20' east of Point Amour, upwards of three hundred bergs, several of them of enormous size; N. 52° 59', W. 51° 39' to Straits of Belle Isle, large and medium-sized bergs in great numbers.

7th.—N. 53° 04', W. 50° 45', one large berg, and from this

position to Belle Isle the sea was thickly studded with large and small bergs. In the Straits of Belle Isle counted forty-seven bergs, mostly packed in the east portion of the straits, and gradually becoming fewer towards Point Amour.

8th.—N. 52° 50', W. 50° 29', large bergs and small broken ice; N. 53° 17', W. 51° 30' to Cape Norman, numerous large and small bergs right in the track of steamers bound through Straits of Belle Isle.

9th.—N. 51° 30', W. 56° 20', large and small bergs.

14th.—N. 53° 27', W. 50° 14' to Cape Norman, large icebergs.

16th.—N. 52° 11', W. 49° 48' to Belle Isle, large bergs.

17th.—Off Point Amour, three large bergs.

18th.—Off Belle Isle, five large bergs; N. 49° 52', W. 54° 07', one large and one small berg; Point Amour to N. 52° 11', W. 53° 52', numerous very large bergs.

19–20th.—Straits of Belle Isle to N. 52° 30', W. 51° 50', a number of bergs, some large.

20th.—N. 43° 34', W. 48° 38', a few small pieces of ice.

22d.—N. 53° 10', W. 50° 04', a large berg, and from that position to Cape Norman, several bergs of various sizes; off Cape Norman, numerous bergs.

23d.—N. 52° 34', W. 52° 30', numerous bergs.

24th.—N. 52° 25', W. 52° 25' to Belle Isle, a number of bergs; in the Fairway, five hundred and seven miles east of Belle Isle, two large bergs aground, saw them in same position last voyage; N. 55° 15', W. 53° 30', four large bergs; N. 58°, W. 40°, a large field of ice; N. 53°, W. 45° to N. 48°, W. 50°, 24th to September 1st, numerous bergs.

25th.—N. 52° 06', W. 48°, large berg about one hundred and fifty feet high; N. 52° 50', W. 51° 26', several small bergs; N. 53° 15', W. 52°, one large berg.

26th.—Straits of Belle Isle clear of ice from Belle Isle to N. 53° 16', W. 51°, where there were numerous bergs large and small; N. 51° 23', W. 50° 40', three large bergs.

TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

The distribution of mean temperature over the United States and Canada for August, 1889, is exhibited on chart ii by dotted isotherms. In the table of miscellaneous meteorological data the monthly mean temperature and the departure from the normal are given for regular stations of the Signal Service. The figures opposite the names of the geographical districts in the columns for mean temperature and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the departure is below the normal and subtracting when above. The monthly mean temperature for regular stations of the Signal Service represents the mean of the maximum and minimum temperatures.

In August, 1889, the mean temperature was highest in the lower valley of the Colorado River, where, at stations in southern Nevada and adjoining parts of Arizona and California, the values rose above 95°, the highest mean reading, 102°.5, being reported at Volcano Springs, Cal. In San Bernardino, the southeastern part of Inyo, and the eastern half of San Diego counties, Cal., southern Nevada, and a considerable portion of southern and western Arizona, the mean temperature was above 90°. The mean readings were above 85° in the Rio Grande Valley, and were above 80° over western Florida, at stations south of a line traced irregularly westward from southern Georgia to Arizona, and in areas in northern Utah, central Kansas, and the valleys of the Sacramento and San Joaquin rivers, Cal. The lowest mean temperature of the month was reported at stations in Lake Co., Colo., along the California coast north of San Francisco, and in the lower Saint Lawrence valley, where it fell to or below 55°. The mean temperature was below 60° along the immediate Pacific coast from San Francisco, Cal., to the British Possessions, central and north-central Colorado, north of a line traced irregularly eastward from the northern coast of Lake Superior to the lower Saint Lawrence valley, and at coast stations in eastern Maine and western Nova Scotia.

The mean temperature was generally below the normal in the Saint Lawrence Valley and the Canadian Maritime Provinces, and from the Atlantic coast states westward south of the Lake region to the middle, eastern, and southeastern slopes of the Rocky Mountains, in the valley of the Columbia River, and at Los Angeles, Cal. Over the upper lakes and thence westward to the valley of the Columbia River, in the Rocky Mountain and plateau regions, and along the middle and southern Pacific coast the month was generally warmer than the average August. The most marked departures below the normal occurred in the Saint Lawrence Valley, southwestern Maine, from central Virginia to the south Atlantic coast, over the southern extremity of Florida, in central Arkansas and northwestern Louisiana, north-central Kentucky, and central

Tennessee, where they equalled or exceeded 3°. The greatest departures above the normal were noted in the British Possessions north of Montana, and in Arizona, where they were more than 5°. Considered by districts, the greatest average departure below the normal temperature occurred in the Florida Peninsula, where it was 2°.7; in the Ohio Valley and Tennessee the average departure below the normal temperature was 2°.5; in the south Atlantic and west Gulf states, 2°.2; in the east Gulf states, 2°.1; in the middle Atlantic states and the southeastern slope of the Rocky Mountains, 1°.8; on the north Pacific coast, 1°.2; in the lower lake region and the upper Mississippi valley, 1°.1; in New England, 1°.0, and in the northern plateau region, 0°.7. The greatest average departure above the normal, 3°.6, occurred in the southern plateau region; in the middle plateau region the average departure above the normal was 2°.1; in the extreme northwest, 2°.0; in the middle eastern slope of the Rocky Mountains, 1°.4; in the northeastern slope of the Rocky Mountains, 1°.2; on the middle Pacific coast, 1°.1; in the upper lake region, 0°.9; in the Missouri Valley, 0°.5, and on the south Pacific coast, 0°.2. In the Rio Grande Valley the mean temperature averaged normal.

The following are some of the most marked departures from the normal at the older established Signal Service stations:

Above normal.		Below normal.	
Whipple Barracks (Prescott), Ariz....	7.4	Father Point, Quebec.....	4.0
Medicine Hat and Qu'Appelle, N.W.T.	6.0	Key West, Fla.....	3.8
Santa Fe, N. Mex.....	3.9	Lynchburg, Va.....	3.6
Denver, Colo.....	2.8	Portland, Me.....	3.4
Salt Lake City, Utah.....	2.4	Little Rock, Ark.....	3.2

DEVIATIONS FROM NORMAL TEMPERATURES.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperature for a series of years; (2) the length of record during which the observations have been taken, and from which the normal has been computed; (3) the mean temperature for August, 1889; (4) the departure of the current month from the normal; (5) and the extreme monthly means for August during the period of observation and the years of occurrence:

State and station.	County.	(1) Normal for the month of Aug.	(2) Length of record.	(3) Mean for Aug., 1889.	(4) Departure from normal.	(5) Extreme monthly mean temperature for Aug.			
						Highest.	Year.	Lowest.	Year.
Arkansas.		°	Years	°	°	°		°	
Lead Hill.....	Boone.....	77.9	7	77.1	-0.8	81.0	1886	75.5	1882